

Science and Engineering Process Standards (SEPS)		Content Connector
SEPS.1 Posing questions (for science) and defining problems (for engineering)	A practice of science is posing and refining questions that lead to descriptions and explanations of how the natural and designed world(s) work and these questions can be scientifically tested. Engineering questions clarify problems to determine criteria for possible solutions and identify constraints to solve problems about the designed world.	A practice of science is posing and refining questions that lead to descriptions and explanations of how the natural and designed world(s) work and these questions can be scientifically tested. Engineering questions clarify problems to determine criteria for possible solutions and identify constraints to solve problems about the designed world.



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SEPS.2 Developing and using models and tools

A practice of both science and engineering is to use and construct conceptual models that illustrate ideas and explanations. Models are used to develop questions, predictions and explanations; analyze and identify flaws in systems; build and revise scientific explanations and proposed engineered systems; and communicate ideas. Measurements and observations are used to revise and improve models and designs. Models include, but are not limited to: diagrams, drawings, physical replicas, mathematical representations, analogies, and other technological models.

Another practice of both science and engineering is to identify and correctly use tools to construct, obtain, and evaluate questions and problems. Utilize appropriate tools while identifying their limitations. Tools include, but are not limited to: pencil and paper, models, ruler, a protractor, a calculator, laboratory equipment, safety gear, a spreadsheet, experiment data collection software, and other technological tools.

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SEPS.3 Constructing and performing investigations

Scientists and engineers are constructing and performing investigations in the field or laboratory, working collaboratively as well as individually. Researching analogous problems in order to gain insight into possible solutions allows them to make conjectures about the form and meaning of the solution. A plan to a solution pathway is developed prior to constructing and performing investigations. Constructing investigations systematically encompasses identified variables and parameters generating quality data. While performing, scientists and engineers monitor and record progress. After performing, they evaluate to make changes to modify and repeat the investigation if necessary.

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SEPS.4 Analyzing and interpreting data

Investigations produce data that must be analyzed in order to derive meaning. Because data patterns and trends are not always obvious, scientists and engineers use a range of tools to identify the significant features in the data. They identify sources of error in the investigations and calculate the degree of certainty in the results. Advances in science and engineering makes analysis of proposed solutions more efficient and effective. They analyze their results by continually asking themselves questions; possible questions may be, but are not limited to: "Does this make sense?" "Could my results be duplicated?" and/or "Does the design solve the problem with the given constraints?"

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<p>SEPS.5 Using mathematics and computational thinking</p>	<p>In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Scientists and engineers understand how mathematical ideas interconnect and build on one another to produce a coherent whole.</p>	<p>In both science and engineering, mathematics and computation are fundamental tools for representing physical variables and their relationships. They are used for a range of tasks such as constructing simulations; solving equations exactly or approximately; and recognizing, expressing, and applying quantitative relationships. Mathematical and computational approaches enable scientists and engineers to predict the behavior of systems and test the validity of such predictions. Scientists and engineers understand how mathematical ideas interconnect and build on one another to produce a coherent whole.</p>
<p>SEPS.6 Constructing explanations (for science) and designing solutions (for engineering)</p>	<p>Scientists and engineers use their results from the investigation in constructing descriptions and explanations, citing the interpretation of data, connecting the investigation to how the natural and designed world(s) work. They construct or design logical coherent explanations or solutions of phenomena that incorporate their understanding of science and/or engineering or a model that represents it, and are consistent with the available evidence.</p>	<p>Scientists and engineers use their results from the investigation in constructing descriptions and explanations, citing the interpretation of data, connecting the investigation to how the natural and designed world(s) work. They construct or design logical coherent explanations or solutions of phenomena that incorporate their understanding of science and/or engineering or a model that represents it, and are consistent with the available evidence.</p>



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<p>SEPS.7 Engaging in argument from evidence</p>	<p>Scientists and engineers use reasoning and argument based on evidence to identify the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation, the process by which evidence-based conclusions and solutions are reached, to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to evaluate claims.</p>	<p>Scientists and engineers use reasoning and argument based on evidence to identify the best explanation for a natural phenomenon or the best solution to a design problem. Scientists and engineers use argumentation, the process by which evidence-based conclusions and solutions are reached, to listen to, compare, and evaluate competing ideas and methods based on merits. Scientists and engineers engage in argumentation when investigating a phenomenon, testing a design solution, resolving questions about measurements, building data models, and using evidence to evaluate claims.</p>
<p>SEPS.8 Obtaining, evaluating, and communicating information</p>	<p>Scientists and engineers need to be communicating clearly and articulating the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations, as well as, orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs.</p>	<p>Scientists and engineers need to be communicating clearly and articulating the ideas and methods they generate. Critiquing and communicating ideas individually and in groups is a critical professional activity. Communicating information and ideas can be done in multiple ways: using tables, diagrams, graphs, models, and equations, as well as, orally, in writing, and through extended discussions. Scientists and engineers employ multiple sources to obtain information that is used to evaluate the merit and validity of claims, methods, and designs.</p>



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Physical Science (PS)	Content Connector
4.PS.1 Investigate transportation systems and devices that operate on or in land, water, air and space and recognize the forces (lift, drag, friction, thrust and gravity) that affect their motion.	<p>4.PS.1.a.1 Investigate transportation systems and devices that operate on/in land, water, air, and space.</p> <p>4.PS.1.a.2 Recognize the forces (lift, drag, friction, thrust, and gravity) that affect the motion of transportation systems and devices.</p>
4.PS.2 Investigate the relationship of the speed of an object to the energy of that object.	4.PS.2.a.1 Investigate the relationship of the speed of an object to the energy of that object.
4.PS.3 Investigate how multiple simple machines work together to perform everyday tasks.	4.PS.3.a.1 Investigate how multiple simple machines work together to perform everyday tasks.
4.PS.4 Describe and investigate the different ways in which energy can be generated and/or converted from one form of energy to another form of energy.	4.PS.4.a.1 No changes, except maybe list the forms of energy.
4.PS.5 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.	4.PS.5.a.1 Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.



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Earth and Space Science (ESS)	Updates
4.ESS.1 Investigate how the moon appears to move through the sky and it changes day to day, emphasizing the importance of how the moon impacts the Earth, the rising and setting times, and solar and lunar eclipses.	4.ESS.1.a.1 Investigate how the moon appears to move through the sky and it changes day to day, emphasizing the importance of how the moon impacts the Earth, the rising and setting times, and solar and lunar eclipses.
4.ESS.2 Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.	4.ESS.2.a.1 Identify forms of energy and fuels that are derived from natural resources and describe how their uses affect the environment.
4.ESS.3 Describe how geological forces change the shape of the land suddenly and over time.	4.ESS.3.a.1 Describe how geological forces change the shape of the land suddenly and over time.
4.ESS.4 Develop solutions that could be implemented to reduce the impact of humans on the natural environment and the natural environment on humans.	4.ESS.4 .a.1 Develop solutions that could be implemented to reduce the impact of humans on the natural environment.
	4.ESS.4 .a.2 Develop solutions that could be implemented to reduce the impact of the natural environment on humans.



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Life Science (LS)	Changes
4.LS.1 Observe, analyze, and interpret how offspring are very much, but not exactly, like their parents or one another. Describe how these differences in physical characteristics among individuals in a population may be advantageous for survival and reproduction.	4.LS.1.a.1 Observe, analyze, and interpret how offspring are very much, but not exactly, like their parents or one another.
	4.LS.1.a.2 Describe how these differences in physical characteristics among individuals in a population may be advantageous for survival and reproduction.
4.LS.2 Use evidence to support the explanation that a change in the environment may result in a plant or animal will survive and reproduce, move to a new location, or die.	4.LS.2.a.1 Use evidence to explain how a change in the environment can affect a plant or animal's: survival, reproduction, and habitat/relocation.
4.LS.3 Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction in different ecosystems.	4.LS.3.a.1 Construct an argument that plants have internal and external structures that function to support survival, growth, behavior, and reproduction in different ecosystems.
	4.LS.3.a.2 Construct an argument that animals have internal and external structures that function to support survival, growth, behavior, and reproduction in different ecosystems.



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Engineering (E)	Updates
3-5.E.1 Identify a simple problem with the design of an object that reflects a need or a want. Include criteria for success and constraints on materials, time, or cost.	3-5.E.1.a.1 Identify a simple problem with the design of an object that reflects a need or a want. Include criteria for success and constraints on materials, time, or cost.
3-5.E.2 Construct and compare multiple plausible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.	3-5.E.2.a.1 Given multiple reasonable solutions to a problem, determine which solution best meets the criteria and constraints of the problem.
3-5.E.3 Construct and perform fair investigations in which variables are controlled and failure points are considered to identify aspects of a model or prototype that can be improved.	3-5.E.3.a.1 Consider results of an investigation, including failure points, and determine which variables affected the outcome.
	3-5.E.3 a.2 Based on the results of investigations, determine whether aspect(s) of a model or prototype have or can be improved.